Curriculum Vitae

General Information

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Place of Birth: Lebanon

Education:

7/2001	BSc high distinction	American University of Beirut
5/2005	MD CM	McGill University Faculty of Medicine
5/2015	MSc	Masters in Biostatistics, Harvard School of Public Health

Postdoctoral Training:

Internships and Residencies

6/2005-6/2006	Intern, Internal Medicine, Massachusetts General Hospital, Boston, MA
6/2006-6/2008	Resident, Internal Medicine, Massachusetts General Hospital, Boston, MA

Clinical and Research Fellowships

7/2008-6/2012	Clinical and Research Fellow, Harvard Combined Pulmonary and Critical Care Medicine Fellowship, Beth Israel Deaconess Medical Center, Brigham and Women's Hospital, and Massachusetts General Hospital, Boston, MA

Faculty Academic Appointment:

7/2008 - 6/2012	Fellow in Medicine, Harvard Medical School
7/2012 -	Instructor in Medicine, Harvard Medical School

Appointments at Hospitals:

7/2008 - 6/2012	Clinical and Research Fellow in Medicine, Harvard Medical School, Boston, MA
9/2011 - 6/2012	Graduate Assistant, Massachusetts General Hospital
7/2012 - 4/2014	Assistant in Medicine, Massachusetts General Hospital
5/2014 -	Assistant Physician, Massachusetts General Hospital

Major Committee Assignments:

2006-2010	Member/Protocol Reviewer, Partners IRB Committee
2016-	American Thoracic Society Mycobacterial and pulmonary infections assembly programs committee
2014-	Reviewer Antimicrobial Agents and Chemotherapy
2014-	Reviewer International Journal of Tuberculosis and Lung disease
2015-	Reviewer American Journal of Pulmonary and Critical Care
2015-	Reviewer PLoS Medicine
2015-	Reviewer PLoS One
2016-	Reviewer Lancet Respiratory Medicine

Professional Society Memberships:

2001-2005	American University of Beirut Alumni Association Montreal Chapter
2001-2005	Canadian and Quebec Medical Students Associations
2001-2005	Canadian and Quebec Medical Associations
2004-2005	International Federation of Medical Students
2005-2008	American Medical Society
2005-2010	Mass. Medical Society
2005-2008	American College of Physicians
2006-	American University of Beirut Alumni Association New England Chapter
2008-	American Thoracic Society
2014-	International Union against Tuberculosis and Lung Disease

Awards and Honors:

2000	*Said Frieha Award*, for Academic Excellence (Pan-Lebanon).
2001	*Phillipe Hitti Award*, from the faculty of Arts and Sciences for the individual who "Exemplifies in his or her academic career the scholarly spirit of the University at its best"
2002	*James Q. Bliss Book Prize*, for "the highest standing in the Gas, Fluid, and Electrolytes unit."
2002	*Mary and Louise Streicher Prize*, "awarded to the student obtaining the highest academic achievement in the Endocrinology, Metabolism and Nutrition unit."
2002	*Joseph Hils Prize*, "awarded to the student obtaining the highest standing in the Musculoskeletal and Blood unit. "
2002	*Francis McNaughton Prize*, "awarded to the student with the highest standing in the Nervous System and Special Senses unit."
2002-4	*James McGill Award*, for "very high academic achievement"
2003	*Sutherland Prize*, "for the highest standing in the Basis of Medicine component of the undergraduate medical curriculum."
2003	*Joseph Morley Drake Prize*, "Award for the student with the highest standing in the Pathobiology, Treatment & Prevention of Disease unit."
2004	*McConnell scholarship*, awarded by McGill for high academic standing
2005	*Award of Quebec Association of Francophone Physicians:* awarded to the medical graduate with the highest academic achievement at each of the Quebec Medical Schools.

2005	*Holms Gold Medal*, awarded for the highest global standing of the medical school class.
2008	*MGH Internal Medicine Residency Humanism Award*
2011	American Thoracic Society selected for the Fellow's Track Symposium and travel award
2011, 2012, 2015	*Excellence in Tutoring Award* Harvard Medical School
2015	*Abstract Award* American Thoracic Society Assembly on Tuberculosis and Pulmonary Infections.
2016	Finalist *Massachusetts General Hospital Innovation Program Award*

Report of Funded and Unfunded Projects:

Past:

Harvard University Center for Aids Research (CFAR) feasibility grant
NIH/NIAID P30 AI060354
Titled "Identification of GyrA/B Mutations that Predict Fluoroquinolone Resistant TB"
Role: PI 9/2012-9/2013

NIH/NIAID U19-AI109755
CETR Integrated Discovery and Development of Innovative TB diagnostics
Role: CoI 3/2014-9/2015

American Lung Association Biomedical Research Grant RG-270912-N
Titled: "Genetic Determinants of Drug Resistance in Mycobacterium tuberculosis"
Role: PI 7/2013-6/2016

Current:

NIH/NIAID/BD2K Initiative K01 ES026835
Titled "New Tools for the interpretation of Pathogen Genomic Data with a focus on Mycobacterium tuberculosis"
Role PI 10/2015-9/2020

Parker B. Francis Foundation Award
Titled: "Genetic Determinants of Drug Resistance in Mycobacterium tuberculosis"
Role: PI 7/2014-6/2017

Harvard Dubai Center for Global Health Delivery Cooperative Grant
Titled: "Building capacity in Pune city, India for rapid diagnosis of tuberculosis (TB) and multidrug-resistance"
Role: PI 12/2016-12/2017

Genome Canada
Titled: "A toolkit for genome-wide association in bacteria"
Role: CoI 9/2016-8/2018

Report of Local Teaching and Training:

Teaching of students in Courses:

2010 -	Harvard Medical School Cardio-pulmonary pathophysiology course tutor to HMS-II students
2011, 2012	Harvard School of Technology tutor on mechanical ventilation and pulmonary physiology.
2014 -	OSCE examiner

Formal Teaching of Residents, Clinical Fellows:

2013 -	RACU core curriculum monthly lecture

Formally Supervised Trainees:

2016 -	Avika Dixit, MD fellow in pediatric infectious diseases Boston Children's Hospital
2013 -	Hanna Guaimares PhD candidate
6-9/2014	Chidi Akusobi, MD/PhD candidate HMS
3-6/2014	Philip Hendl Bioinformatics undergraduate student, visiting from Austria
6-8/2015	Lanhao Chen, Undergraduate in Business analytics George Washington University (Joint with IQSS). Mentored on machine learning, scripting.

Formal Teaching of Peers:

2013	Beth Israel Deaconess Critical Care Course (CME) critical care ultrasound instructor
2015 -	Harvard Pulmonary and Critical Care Course (CME) lecture on antibiotic resistance

Local Invited Presentations:

2012	Broad Infectious Disease Initiative seminar series
2012	Brigham and Women's Pulmonary research seminar
2013	Channing Laboratory Statistical Genetics research seminar
2013	Massachusetts General Hospital and Beth Israel Deaconess combined fellowship grand rounds
2015	Harvard TB Center for Excellence in Translational Research monthly scientific seminar
2015	Harvard School of Public Health, Seminar on Drug Discovery for Tuberculosis

Report of Regional, National and International Invited Presentations:

2/2014 New Diagnostics Working Group for Tuberculosis symposium, London, UK. Invited presentation on TB data sharing and database development.

10/2014 New Diagnostics Working Group for Tuberculosis 2nd meeting, Barcelona, Spain. Invited presentation on development needs for database development.

10/2015 American Society for Microbiology New England Chapter Meeting: Speaker on innovations for mycobacterial disease and emerging drug resistance.

11/2015 University of Helsinki, School of Veterinary Medicine. Speaker on Genome wide association studies in bacteria.

2/2016 Critical Path to TB Drug Regimens (CPTR) forum on Tuberculosis Big Data for drug resistance. Invited presentation.

Report of Clinical Activities

Licensure:

2003	USMLE Step 1
2005	USMLE Step 2
2005	Canadian Licensing Exam
2007	USMLE Step 3
2008	Massachusetts Full Medical License
2009	American Board of Internal Medicine
2010	American Board of Medical Specialties – Pulmonary Medicine
2011	American Board of Medical Specialties – Critical Care Medicine

Practice Activities:

2005-2008	MGH Internal Medicine associates- Provider of primary care
2008-2011	BWH Center for Chest Diseases- Provider of Outpatient pulmonary care
2011	BWH Center for Chest Diseases- Fellow in Massachusetts State TB clinic
7/2012-	MGH Attending in pulmonary and critical care medicine
7/2014-	MGH Attending on the house-staff (Bigelow) general medicine teaching service

Clinical Innovations:

2006 Development of a risk prediction calculator to aid clinician in interpreting the tuberculin skin test: available at: http://www.tstin3d.com/

2015 Development of a web interface for prediction of drug resistance and Mycobacterium tuberculosis data analysis and sharing: http://gentb.hms.harvard.edu/

Report of Education of Patients and Service to the Community

1999-2001 Lebanese Red Cross: education, health awareness, socialization of the Lebanese youth.

2013- Participant in the Global Health Delivery Online Community. Contribute to discussions around tuberculosis, drug resistance, and diagnostics.

Report of Scholarship

Publications:

Peer reviewed publications: Also available at
http://www.ncbi.nlm.nih.gov/sites/myncbi/1f5e_XTK7evQc/bibliography/45264981/public/?sort=date&direction=ascending

Farhat M, Greenaway C, Pai M, Menzies D. False-positive tuberculin reactions due to non-tuberculous mycobacterial infections. Int J Tuberc Lung Dis 2006 10(11): 1192

Menzies D, Gardiner G, **Farhat M**, Greenway C, Pai M. Thinking in three dimensions: a web-based algorithm to aid the interpretation of tuberculin skin test results. Int J Tuberc Lung Dis 2008 12(5): 498

Colijn C, Brandes A, Zucker A, Zucker J, Lun DS, Weiner B, **Farhat MR**, Cheng TY, Moody DB, Murray M, Galagan JE. Interpreting expression data with metabolic flux models: predicting Mycobacterium tuberculosis mycolic acid production. PLoS Comput Biol. 2009 5(8):e1000489

Karvellas CJ, **Farhat MR**, Sajjad I, Mogensen SS, Leung AA, Wald R, Bagshaw SM. Meta-analysis of early vs late RRT in the critically ill. Crit Care. 2011;15(1):R72. doi: 10.1186/cc10061. Epub 2011 Feb 25. Review. PubMed PMID: 21352532.

Farhat MR, Loring S, Riskind P, Weinhouse G. Disturbance of Respiratory Muscle Control in a Patient with Early Stage Multiple Sclerosis. Eur Respir J. 2013 Jun;41(6):1454-6.

Farhat MR, Shapiro BJ, Kieser KJ, Sultana R, Jacobson KR, Victor TC, Warren RW, Streicher EM, Calver A, Sloutsky A, Kau D, Posey JE, Plikaytis B, Oggioni MR, Gardy JL, Johnston JC, Rodrigues M, Tang PK, Kato-Maeda M, Borowski ML, Muddukrishan B, Kreiswirth BN, Kurepina N, Galagan J, Gagneux S, Birren B, Rubin EJ, Lander ES, Sabeti P, Murray M. Genomic analysis identifies targets of convergent positive selection in drug-resistant Mycobacterium tuberculosis. Nat Genet. 2013 Oct;45(10):1183-9. doi: 10.1038/ng.2747. Epub 2013 Sep 1. PubMed PMID: 23995135.

Nebenzahl-Guimaraes H, Jacobson KR, **Farhat MR**, Murray M. A systematic review of mutations that confer drug resistance in Mycobacterium tuberculosis. J Antimicrob Chemother. 2014 Feb;69(2):331-42. doi: 10.1093/jac/dkt358. Epub 2013 Sep 20. Review. PubMed PMID: 24055765.

Farhat MR, Shapiro BJ, Sheppard SK, Colijn C, Megan M. A phylogeny-based sampling strategy and power calculator informs genome-wide associations study design for microbial pathogens. Genome Med. 2014 Nov 15;6(11):101. doi: 10.1186/s13073-014-0101-7. eCollection 2014. PubMed PMID: 25484920.

Farhat MR, Mitnick C, Franke M, Devinder K, Sloutsky A, Murray M, Jacobson KR. Concordance of *Mycobacterium tuberculosis* Fluoroquinolone Resistance testing: implications for treatment. Int J Tuberc Lung Dis. 2015 Mar;19(3):339-41. doi: 10.5588/ijtld.14.0814. PubMed PMID: 25686144.

Ramly EP, Bohnen JD, **Farhat MR**, Razmdjou S, Mavros MN, Yeh Dante, Lee J, Butler K, De Moya M, Velmahos G, Kaafarani MA. The epidemiology, clinical outcomes, and financial impact of intraoperative adverse events in emergency surgery. Am J Surg. 2015 Oct 23. PubMed PMID: 26601649

Farhat MR, Jacobson KR, Franke MF, Kaur D, Sloutsky A, Mitnick C, Murray M. Gyrase mutations are associated with variable levels of fluoroquinolone resistance in Mycobacterium tuberculosis. J Clin Microbiol. 2016 Jan 13. pii: JCM.02775-15. PMID:26763957

Farhat MR, Razvan S, Bozeman S, Iartchouk O, Galagan J, Sisk P, Nebenzahl-Guimaraes H, Jacobson K, Sloutsky A, Kaur D, Posey J, Kreiswirth BN, Kurepina N, Rigouts L, Streicher EM, Victor TC, Warren RM, Van Soolingen D, Murray M. Genetic Determinants of Drug Resistance in Mycobacterium Tuberculosis and their diagnostic value. Am J Respir Crit Care Med. 2016 Feb 24 [Epub ahead of print] PMID: 26910495

Farhat MR, Nebenzahl-Guimaeres H, van Laarhoven A, Koeken V, Mandemakers J, Netea M, Murray M, van Crevel R, van Soolingen D. Convergent evolutionary analysis identified genetic markers of Mycobacterium tuberculosis transmissibility that are associated with altered cytokine and neutrophil response. Under review American Journal of Respiratory and Critical Care Medicine

Andre E, Isaacs C, Affolabi D, Alagna R, Brokmann D, Cambau E, Churchyard G, Cohen T, De Jong BC, Delmee M, Delvenne JC, Denkinger C, Digovich K, **Farhat MR**, Habib A, Holme P, Kashongwe Z, Keshavjee S, Khan A, Moore D, Moreno Y, Mundade Y, Pai M, Nyaruhirira A, Rocha LEC, Takle J, Trebucq A, Van Soolingen D, Creswell J, Boehme C. Connectivity of diagnostic technologies: combining data sources to improve surveillance and accelerate TB elimination in the post-2015 era. International Journal of Tuberculosis and Lung Disease 2016 Aug;20(8):999-1003. PMID: 27393530

Non-peer reviewed publications:

A 59 year old woman with diabetic renal disease and non-healing skin ulcers. (Case presenter: Case records of the Massachusetts General Hospital) N Engl J Med 2007; 356: 1049.

Cobelens FG, Menzies D, **Farhat M**. False-positive tuberculin reactions due to non-tuberculous mycobacterial infections-author's reply. Int J Tuberc Lung Dis. 2007 11(8); 934

Lung Cancer. Respiratory care: Principles and Practice. Second Edition. Dean R. Hess et al. 2011 Chapter 47: 971.

Lung Cancer. Respiratory care: Principles and Practice. Third Edition. Dean R. Hess et al. 2014 Chapter 45: 1053.

Professional educational materials

Chronic Pain. MGH Primer of Outpatient Medicine. 2006

Tuberculosis. MGH Handbook of Global Medicine. 2007

Mechanical Ventilation. MGH House staff manual. 2007

Abstracts, Poster Presentations at Professional Meetings:

12/2006 Who develops active TB? A multifactorial risk assessment tool for determining risk of active TB. ACP Massachusetts Abstract competition awardee. Waltham. Oral Presentation.

5/2011 High synonymous substitution rates in ribosomal protein genes of *Mycobacterium tuberculosis*. ATS international meeting. Denver, CO. Poster presentation.

2011 Whole genome analysis of drug resistant tuberculosis: findings on isoniazid resistance. New England Tuberculosis Meeting. Boston, MA June. Poster presentation. Respiratory Disease Young Investigator's Forum, Atlanta, GA Sept. Selected for oral presentation.

5/2012 Natural selection testing of drug resistant TB. ATS international meeting, San Francisco, CA. Poster presentation

5/2012 Several genes show evidence for positive selection in drug resistant TB. Keystone Symposium on TB resistance and Persistence, Uganda. Poster presentation

6/2012 Whole genome tests for positive selection in drug resistant TB. New England Tuberculosis Meeting, Boston, MA. Oral presentation.

2014 Quantitative vs Qualitative Fluoroquinolone drug resistance testing. CFAR meeting Boston. Poster presentation

5/2015 Large Scale Sequencing of Genetic Determinants of Drug Resistance in Mycobacterium tuberculosis: Implications for Diagnostic Design. ATS international meeting, Denver, CO. Oral presentation and abstract award.

11/2015 A Web-based Interface to Explore and Analyze Mycobacterium tuberculosis Whole Genome Sequence & Phenotype Data. NIH BD2K AHM Bethesda, MD. Poster Presentation.

12/2015 GenTB: A Web-based Interface to Explore and Analyze Mycobacterium tuberculosis Whole Genome Sequence & Phenotype Data. International Union of Tuberculosis and Lung Disease Meeting. Cape Town, South Africa. Oral Presentation

Narrative Research Report:

Bacterial whole genome sequence data carry a wealth of information relevant to the diagnosis and surveillance of infectious diseases. My current area of research lies at the intersection of epidemiology, bioinformatics, computational and evolutionary biology as applied to microbial genome science. I am interested in identifying genetic biomarkers of infectious disease determinants with a current strong focus on *M. tuberculosis* and drug resistance, and the development of biostatistical methods to do this. I am also invested in the development of intuitive interpretation tools and metrics for the use of microbial big data for eventual clinical and laboratory use in resource poor settings.